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BIOFUELS ANNUAL

Japan to Focus on Next Generation Biofuels

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Report Highlights:
Due to limited agricultural production, and the "food v. fuel" debate, the Government of Japan has opted to focus determinedly on biofuels derived from cellulosic materials or other materials which do not compete with the food supply. Ethanol production for fuel in 2009 is 36,000 kl, biodiesel production was roughly 8,600 kl, and ETBE imports in 2010 were roughly 700 thousand kl.

Post:
Tokyo

Author Defined:

Executive Summary:

Government and private sector research and investment in biofuels have been on the rise since Japan's first biomass plan, "Biomass Nippon Strategy," was unveiled in December 2002. That Strategy was updated in 2008, and the Government of Japan's (GOJ's) current strategy, given the country's limited land resources, is to focus determinedly on cellulosic biofuel as the future for Japan's biofuel production.

During the past few years, in the wake of higher food prices, biofuel production has been under considerable criticism by Japanese lawmakers and media, often bearing the blame for driving up commodity prices. In fact, it was this supposed link between biofuels and higher commodity prices that inspired the GOJ to include food prices and food security in the G-8 Summit agenda held in July 2008 in Hokkaido, Japan.

Despite the slight backlash, the GOJ and the private sector continue to pursue biofuels production

through conventional and cellulosic means with increasing focus on cellulosic sources in order to meet Japan's Kyoto Protocol commitments to reduce greenhouse gas emissions by 6 percent from the 1990 level by 2012. [1][2] However, given Japan's limited capacity for agricultural production, it will be difficult for Japan to produce enough biofuels to impact the domestic fuel market, and thereby greenhouse gas emissions, without a major technological breakthrough.

Indeed, during the mark-up of national budget conducted by the Government Revitalization Unit in November, 2010, many of the government's biomass projects were marked as "to reduce the budget in half" or "to revise" or "to abolish." In February, 2011, the Ministry of Internal Affairs and Communications released the findings of a policy assessment of biomass promotion projects over a six-year period through March 2009. The cumulative funds spent totaled about 6.55 trillion yen (approximately $82 billion). The Ministry's Administrative Evaluation Bureau found that almost none of the government's biomass projects have produced any effective results in the struggle against global warming. They also pointed out that several ministries and agencies are conducting virtually identical projects.

In terms of biofuel production, the impact of the Great East Japan Earthquake and Tsunami that occurred on March 11, 2011 on Japan's biofuels production is negligible. And despite the fact that there is wide-spread skepticism of the GOJ's nuclear energy safety protocols, the GOJ has not signaled an intention to increase investments in biofuels. This is largely because generating electricity from biofuels or biomass is costlier than other renewable energies, such as solar and wind powers. However, the GOJ plans to build five power plants in the disaster stricken areas to generate electricity from burning wooden wreckage left from the March earthquake and tsunami. Because the costs will be higher than those of running wind and solar power facilities, the GOJ plans to subsidize companies that participate in the project. After all the wreckage has been cleaned up, the power plants will use wood from forest-thinning for fuel.

In the wake of a nuclear power plant accident in Fukushima, the GOJ is now in the midst of reviewing its energy policies. Several expert panels and task forces were established to discuss the direction of Japan's energy policies from different angles, such as industrial competitiveness and environmental impacts. The discussions are currently underway.

Overview of Japan's Fuel Strategy

Japan's transportation sector is almost 100 percent dependent on fossil fuel. In the national energy strategy, released in May 2006, the GOJ articulated the goal of decreasing dependency on fossil fuel to 80 percent by 2030. Biofuels are considered to be an important renewable energy resource to achieve that goal. The GOJ has set a goal to introduce 500 thousand kl (oil basis) of biofuels by 2017 [3] and to produce next generation biofuels domestically by 2015, aiming to sell at a price of Y100 per liter. Other means to achieve the goal are batteries, hydrogen and fuel cells, and clean diesel.

Policy and Programs:

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[1] *In fiscal 2009, Japan's CO2 emission level got lower by 4.1% from the 1990 level due mainly to economic slowdown triggered by Lehman's fall.*

[2] *The current Democratic Party of Japan government has set a mid-term goal to reduce Japan's greenhouse gas emissions by 25% from the 1990 level by 2020.*

[3] *The post estimates that the supply of biofuels in 2010 is roughly 175 thousand kl (oil basis). It is about 0.3% of domestic fuel consumption.*

Ministries Involved in the Bio-fuels Policy

Several ministries collaborate on Japan's biofuels policy including: The Ministry of Economy, Trade and Industry (METI); the Ministry of Agriculture Forestry and Fisheries (MAFF); the Ministry of Environment (MOE); the Ministry of Education, Culture, Sports, Science and Technology (MEXT); the Ministry of Land, Infrastructure and Transport (MLIT); and the Ministry of Internal Affairs and Communications (MIC). Substantial discussions and coordination among the ministries are done in the Executive Committee on Biomass Nippon Strategy, which is comprised of director-general level officials from the relevant ministries. MOE's main concern is meeting Kyoto Protocol commitments, preventing global warming, and expanding the conversion of waste products into energy. METI collaborates with the energy industry and is interested in analyzing the cost-benefit of shifting to renewable fuels, and their impact on automobiles and infrastructure, and thus is involved in feasibility studies. MAFF's goal is to produce biofuels domestically from existing sources (sugarcane, rice, rice straws and husks, and woody materials). However, the focus has shifted to the use of sources that are not used for food, e.g., cellulosic materials. The New Energy and Industrial Technology Development Organization (NEDO) is overseen by METI and funds research and development, and conducts post-project technology evaluations. NEDO is managing several of the ongoing biomass studies in Japan.

Policy Overview

Japan's first biofuel plan, "Biomass Nippon Strategy," was unveiled in December 2002 with four pillars: 1) preventing global warming; 2) creating a recycling society; 3) nurturing strategic industries; and 4) revitalizing rural communities. When the Kyoto Protocol was ratified in February of 2005, Japan felt compelled to move rapidly towards the promotion of biofuels to meet its commitment to reduce CO2 emissions by 6 percent from the 1990 level by 2012 (In fiscal 2009, Japan's CO2 emission level was 4.1 percent lower than the 1990 level). Accordingly, in March 2006, Japan revised the Biomass Nippon Strategy to emphasize the use of biofuels for transportation. It set a goal of replacing fossil fuels with 500,000 kl (oil basis) of biofuels for the transportation sector by 2010. In February 2007, the Executive Committee on Biomass Nippon Strategy released a report titled, "Boosting the Production of Biofuels in Japan." The report presented to the Prime Minister claimed that Japan will be able to produce 6 million kl of biofuels domestically by around 2030 if appropriate technological advancement is realized. It sets a target of producing 50,000 kl of biofuels from molasses and off-spec rice, and 10,000 kl of biofuels from construction waste by 2011. In addition, the report sets a goal of producing 6 million kl (estimation by MAFF) of biofuels per year, 10% of domestic fuel consumption, from cellulosic materials such as rice straw, tinned wood and resource crops such as sugar cane, sugar beet by around 2030. This ambitious target is based on the estimation that Japan has unused biomass resources (non-edible portions of farm crops and forestry residues) equivalent to 14 million kl of oil, and that it could produce resource crops equivalent to 6.2 million kl of oil by fully utilizing the abandoned arable land, which is estimated at 386,000 ha. MAFF's goals are not shared by all Ministries, but MAFF officials are optimistic that by putting all their efforts and considerable financial backing into cellulosic research and development they can meet this goal.

Move toward Biofuels Sustainability Standards

The run up in food prices in 2008 caused governments around the world to re-think their biofuels strategies. Policy makers have started to consider the feasibility of biofuels using an evaluation tool called the Life Cycle Assessment, which aims to calculate the environmental impact of a good, a process or a service "from cradle to grave". The impact includes all relevant environmental aspects such as cumulative energy demand, climatic change, acidification, nutrification, land occupation, photochemical oxidation, ecotoxicity, human health, etc. After quantifying the energy and substances

flows occurring at each step of the product/service life cycle (Life Cycle Inventory or LCI), the Life Cycle Impact Assessment (LCIA) transpose these flows into a potential impact, as per the main damage categories (as listed above). The results are mainly used in comparative approaches, in order to compare several scenarios ending with the same functional unit. In line with the global trends, the GOJ began to consider establishing its own sustainability standards of biofuels. METI, in cooperation with MAFF and MOE, set up a Study Panel to Discuss the Introduction of Sustainable Biofuels. The panel released an interim report in March 2010. The report recommends that: 1) Japan set the LCA's CO2 reduction level at 50 percent; 2) Japan increase domestic production of biofuels, which is currently 3 percent of the total supply, to more than 50 percent (this would include biofuels produced in other Asian countries, partially supported by GOJ funding); and 3) Japan emphasize cellulosic or other non-food materials to produce biofuels in order not to compete with the food supply. Based on the discussion by the panel, METI decided to treat biofuels as a source of greenhouse gasses and require oil companies to cut emissions. Though biofuels are treated as zero-emission fuels under the Kyoto protocol, the LCA method considers CO2 emissions of primary inputs, from the from cultivation of raw materials to transportation of the final products. In March, 2010, MOE released the first version of the "LCA Guideline for Biofuels" for manufacturers and importers of biofuels in Japan for them to assess their biofuels businesses in light of the LCA. In November, 2010, METI has set its requirement on oil firms. The companies who do not comply will be penalized in some way.

Government Incentives and Import Regimes

In 2008 the GOJ introduced tax incentives to encourage the use of bioethanol by amending the Act on the Quality Control of Gasoline and Other Fuels, which is implemented by METI. The gas tax is usually Y53.8 per liter (approximately USD .67). Under the new tax system, if a fuel contains 3 percent bioethanol, the gas tax is lowered by ¥1.6 per liter (approximately USD .02). This tax measure is effective until March 31, 2013. In order to guarantee bio-gasoline quality, a registration system for bio-gasoline blenders was implemented.

In October, 2008 the Law to Promote the Usage of Biomass Resources to Produce Biofuels came into force. The legislation includes tax breaks and financial assistance for biofuel manufacturers and farmers producing feedstock, such as agricultural cooperatives and private businesses. The government encourages collaboration of those two groups, and their plans will be monitored by MAFF in order to qualify for the benefits. Under the scheme, the fixed property tax for newly built biofuel facilities will be reduced in half for three years. Interest-free loans for a redemption period of ten years will be provided to farmers producing feedstock.

The import tariff on Ethyl Tert-Butyl Ether (ETBE) derived from biomass (3.1 percent) will continue to be removed this year (April 1, 2011 to March 31, 2012) under the Act on Temporary Measures concerning Customs.

For clean diesel vehicles, the automobile weight tax and the automobile acquisition tax are exempted for the vehicles weighing less than 3.5 metric tons. These tax breaks are effective until March 31, 2012.

Bioethanol and Biodiesel:

Japan's Motor Vehicles Petroleum Based Energy Market

According to the Japan Automobile Manufactures Association (JAMA), there are 74 million automobiles in Japan (gas and diesel) and domestic fuel consumption is around 60 million kl per year for gasoline and 36 million kl per year for diesel. If a three percent ethanol blend gasoline (E3) were

nationalized, it is estimated that demand for ethanol would be around 1.8 million kl. In the case of 10 percent ethanol blend gasoline (E10), demand would be 6 million kl per year.

Japan's Gasoline Market

The Japanese gasoline market is made up of large companies. There are almost no independent dealers, and only a handful of companies import oil and/or gasoline. These roughly ten companies are organized into five groups, and they sell to their own contacts through a formalized distribution system. The companies form the Petroleum Association of Japan (PAJ). In January 2007, several member companies of the PAJ jointly established Japan Biofuels Supply LLP (JBSL), a company to import bio-ETBE. In April 2007, PAJ imported through JBSL 7,500 kl of bio-ETBE from France and mixed it with gasoline at a refinery in Yokohama to make a 7 percent ETBE blend. On April 27, 2007 PAJ started to sell bio-gasoline as an alternative to regular fuel for the first time on a commercial basis at 50 gasoline stations in the greater Tokyo area. In April 2008, PAJ imported approximately 6,500 kl of ETBE from Brazil; where the price is reportedly 20-30% lower than its competitor in Europe. In October 2008, PAJ announced that it has entered into a long-term contract with Copersucar, the Brazilian supplier of bioethanol, to purchase 200 thousand kl per year. The ethanol is shipped to the U.S. to produce ETBE, which then is exported to Japan. In late 2009, the first shipment of 22 thousand kl of ETBE produced in the Channelview plant of Lyondell Basell in Texas arrived in Japan. PAJ is aiming to expand the sales of bio-gasoline nationwide to 210 thousand kl (oil basis) by 2012. For that purpose, it plans to import 840 thousand kl of ETBE. To date, the bio-gasoline is available at 1,717 gasoline stations nationwide.

Bio-gasoline is currently sold at the same price as that of regular gasoline though the production cost is higher by Y7~8 per liter (approximately USD .08~09). The difference is currently borne by the industry alone as the government support ceased at the end of fiscal 2008.

Bio-diesel Policy

With respect to bio-diesel, the GOJ decided that the blending ratio of Fatty Acid Methyl Ester (FAME) into light oil should be less than 5 percent, in order to ensure that the fuel meets safety and gas emissions standards for existing vehicles. This new requirement was added to the Light Oil Standard under the Quality Control Law and became effective in March 2007. In Japan, because 100 percent bio-diesel fuel (B100) is not subject to the light oil transaction tax, many regional governments have initiated measures to use competitive B100 for their official vehicles, such as garbage trucks. However some have pointed out that problems may occur because automobiles distributed in Japan are not designed to use B100. Indeed, media reports state that a number of problems with engines that use B100 have been reported. According to the reports, the problem is caused when the fuel filter is clogged with impurities in the fuel made from used edible oil.

In the transportation sector, the GOJ hopes to promote clean diesel vehicles, as diesel fuel is more energy efficient than gasoline fuel and CO2 emissions are lower. The GOJ introduced tax breaks for clean diesel vehicles in 2009. Sulfur free diesel oil was introduced in the market in 2005 and currently is available throughout the nation.

Production

Ethanol Production

The initial thrust of Japan's biofuels movement focused on traditional production techniques,

analogous to those used in the United States and other producing countries. MAFF has joint partnerships with local agricultural cooperatives, as well as alcohol and trading companies, to operate several model plants. MOE, METI and others also have a number of projects in the works. The following is a description of a select few of the model plants and facilities in Japan.

Utilizing MAFF's subsidies, which pay for up to 50 percent of the cost of building plants, two major facilities were built in Hokkaido, Japan's agricultural heartland, for launch in April 2009: one run by Oenon Holdings, a holding company of several sake breweries, is in Tomakomai and is using rice; the other is in Shimizucho and intends to use off-spec wheat and sugar beets. The project in Shimuzucho is a public-private partnership between Mitsubishi Corp. and Hokuren, the federation of agricultural cooperatives in Hokkaido. Oenon Holdings and Hokuren are the first commercially viable ethanol plants in Japan with an annual production of 15,000 KL each. That ethanol is used to produce ETBE. In order to produce 15,000 KL of ethanol, approximately 33,000 MT of rice, 35,000 MT of wheat or 150,000 MT of sugar beets are needed. A third facility in Obihiro City, Hokkaido is run by the Tokachi Foundation and is supported by prefectural and national funds. The Foundation runs a very small still that converts Hokkaido-grown wheat into ethanol to fuel a single test vehicle. The equipment is all state of the art, expensive, and on a miniature scale. The Foundation says that this is a "proof of concept" project intended simply to see whether they could produce ethanol from wheat to fuel the vehicle.

There is one model plant in Niigata that is operated by JA Zen-noh, a federation of agricultural cooperatives with MAFF's support. It uses high yield rice grown specifically for biofuel production (800 kg/1000 m2 vs 500 kg/m2 for food use rice). The project began in 2006 using fallow land set aside in MAFF's acreage reduction plan. In 2009 the facility began to produce 1000 kl of bioethanol requiring about 2,250 tons of rice. The ethanol is used as part of an E3 blend and the sales began in March 2009 at 20 affiliated gas stations around Niigata prefecture.

In addition, there are ten more ethanol facilities nationwide including one in Okinawa using sugar cane as the fuel stock. All those are small-scale built for bioethanol verification projects supported by the GOJ.

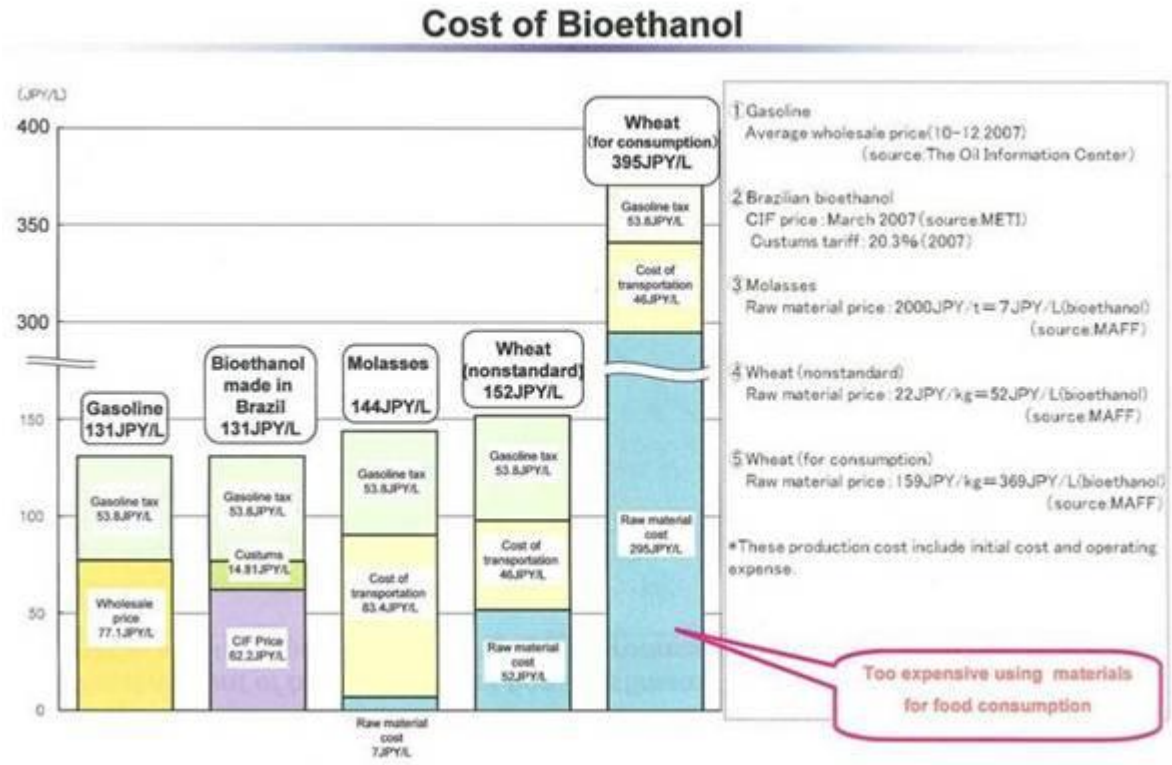
In order for these plants to make commercial sense, these commodities must be purchased at a significantly lower-than-market price. In the case of rice, it would have to be cheaper than feed-quality rice, which is already one-fifth the price of table rice. Like rice, the government also very tightly manages prices of wheat and sugar beets. Therefore, there is little incentive for farmers to sell these commodities at a price these ethanol plants can afford unless the GOJ provides an additional incentive to support the price gap.

The above-mentioned pilot projects and small-scale production facilities will not be enough to meet the goal to domestically produce of 50 thousand kl of bioethanol by 2011.

Over the past few years, the emphasis for bioethanol production has shifted to research and development of cellulosic technology using readily available inputs that will not compete with the food supply, e.g. rice straw. The budget request that MAFF submitted for fiscal 2008 was Y3.2 billion (approximately USD 34 million) for soft-cellulosic research. For fiscal 2009, METI requested a budget for research and development of an integrated system of production of bio-ethanol from cellulosic sources and to study the sustainability and the Life Cycle Assessment of the biofuel. The total budget amount for research and development of cellulosic technology has remained the same level as the previous year and 24 percent or Y776 million (approximately USD 8.2 million) of the budget was allocated to METI. In the past two years, under the MAFF scheme, four projects were selected to produce ethanol from rice straw and husk and wheat straw. MAFF contributes 50 percent of the

project costs.

Figure 1 Production Cost of Bioethanol



Source: MAFF

Bio-diesel Production

Municipal governments and regional non-profit organizations are conducting a small-scale bio-diesel feasibility project called the "Rapeseed Project" that increased to 120 locations in 2008. The project is to grow rapeseed to produce cooking oil and collect the used oil to recycle as bio-diesel fuel. There is another small-scale project to collect used vegetable oil from restaurants and individual households. A couple of major restaurant chain operators are participating in the project. The oil is processed into bio-diesel fuel for use in government vehicles or municipal buses. The current production of bio-diesel fuel is estimated to be 20 thousand kl per annum.

In June 2010, MAFF started a joint research project with private firms and universities to produce biofuel from algae. The research will attempt to extract oil produced by *Pseudochoricystis* algae, with the goal of developing mass production technology, hoping to commercialize the fuel as substitute for gasoline and diesel by 2020. It is estimated that algae-based biofuel could meet 10 to 20 percent of domestic demand for diesel if the effort is successful.

Impact of Use of Agricultural Feedstock in Biofuel Production on Existing Markets

Previously, biofuels policy was aimed at nurturing agriculture and revitalizing rural communities, and one of the ways of doing so was to increase agricultural production. The use of existing feedstock such as rice straw and off-spec wheat was also included in the initial plan, and is now receiving the most focus. This is in part a reaction to the "food v. fuel" debate that has received media attention in Japan.

It also reflects a strategic refocus on how Japan can best achieve its goals in the biofuels sector. Thus, taking used vegetable oil, rice straw or even certain rice stocks off the market does not take away from existing markets for feed, etc. Even if ethanol production facilities operated in Japan absorb traditional commodities like rice or sugar beets, their impact on the existing food and feed markets would be negligible because the amounts are very small portions of the total supply of these commodities: rice about 0.4 percent; wheat, 0.6 percent; and sugar beets, 3.5 percent.

Consumption

Direct Blending and ETBE

There are two methods for blending bio-ethanol with gasoline, "direct blending" and "ETBE." In Japan, MOE promotes direct blending while METI supports the ETBE method. The reason for the latter is that it is more costly for oil distributors to renovate the facilities for direct blending. One report estimates the cost to replace or upgrade existing infrastructure would be Y300-500 billion ($3-5 billion). MAFF has favored promoting direct blending. However, it is yielding to support the ETBE method in order to secure the distribution channel for domestically produced bio-ethanol. In 2009, two MAFF supported bio-refineries, Hokuren, the federation of agricultural cooperatives in Hokkaido, and Oenon Holding started to sell the bio-ethanol they produce to PAJ for blending with ETBE. The total production capacity of those two refineries is 30 thousand kl per year.

Japan's Ethanol Blend Limit

Japan's ethanol blend limit remains low by U.S. standards at 3 percent. A number of potential hazards have been raised, including automobile part corrosion. However, there are feasibility studies looking at the potential for introducing a 10 percent blend in the future. MOE, at present, aims to introduce E10 to the market in 2012. Japanese automakers have started to introduce some new models that can run on E10. Reportedly, in 2008 Toyota Motor Corp. supplied two vehicles to the Ministry of Transportation for use in road testing an E10 ethanol blend in Osaka prefecture. Nissan Motor Co. received approval from the GOJ for an E10 version of its Murano.

The GOJ has a rigorous testing and monitoring scheme to measure the effects of E3 on vehicles and the environment and how best to introduce ethanol to the market. In 2004 and 2005, METI commissioned the Japan Petroleum Energy Center to conduct experimental studies on the prospects for buying or producing, distributing and using ethanol-blended fuel. The ethanol is refined in Yokohama and distributed to service stations in Akita, Chiba, Toyama, Mie, Osaka and Fukuoka Prefectures.

E3 usage is still quite limited in Japan. For example, in Osaka the number of cars that are registered to use E3 gasoline is 1,688 (as of February 2010). Only 18 gasoline stations in the Osaka and nearby Hyogo prefectures sell E3 gasoline. This is a project supported by MOE, which promotes the direct blending method. Meanwhile, PAJ started selling bio-gasoline (regular gasoline blended with bio-ETBE) in those areas. The two different types of biofuels are actually competing in the market, and the competition has expanded as Mitsui Oil Co., an oil wholesaler, began selling E3 gasoline at affiliate gas stations in Ibaraki prefecture this year. The E3 gasoline was made and supplied by Brazil-Japan Ethanol Co., an affiliate of Petrobras, the Brazilian state-run oil supplier. Brazil-Japan Ethanol Co. itself started to supply E3 gasoline to gas stations in Chiba prefecture affiliated with agricultural cooperatives. Both Ibaraki and Chiba prefectures are located in the greater Tokyo metropolitan area. Though the production cost is higher than that of regular gasoline, the E3 gasoline is sold at the same price thanks to subsidies from MOE.

Trade

Imports of ethanol and biodiesel for transportation are negligible. However, because of joint ventures established between Japanese and Brazilian firms starting in 2010, imports of bioethanol will likely increase. MOE aims to supply 1.9 million kl of ethanol by 2020. Of the total, 0.9 million kl will be imports. Imports of ETBE started in 2007. 7,500 kl of ETBE was imported from France in 2007 and 6,694 kl from Brazil in 2008. In 2009, 56,293 kl was imported from Brazil and the U.S. In 2010, approximately 700 thousand kl of ETBE was imported from the U.S.

Investment

Japan is engaged in a mixture of public and private investment and development projects in other countries. In terms of development, in order to help reduce green house gas emissions, Japan will provide technical assistance to Southeast Asian nations, in particular, to Thailand and Vietnam from 2010. Several Japanese trading companies have started to invest in Malaysia and Indonesia for producing biodiesel from palm oil and bioethanol from sugar cane and jatropha. Some Japanese trading companies have shown interest in Brazilian ethanol investments. This includes sugar cane farms as well as the associated ethanol production facilities. For example, in July 2008 Mitsui and Petrobras announced a joint venture in the cerrado region of the Brazilian state of Goias. One of the main goals is to export the sugar-based ethanol overseas, including to Japan. In 2009, the firm started the operation of its ethanol facility of which production capacity is 200 thousand kl per annum. Sojitz Corporation has expanded investment on its Brazilian joint venture firm to increase exports to Japan and Europe by tripling the output capacity to 3.5 million kl by 2015.

Advanced Biofuels:

Japan's scientific community, including universities, and public and private research institutions, has been expending significant effort toward basic and applied research related to biofuels. The focus of research has shifted to cellulosic sources and technologies in light of recent discussion on the sustainability of biofuels. MAFF recently started a research project with some private firms and universities to produce fuel from algae. It aims to commercialize the product as a substitute for gasoline and diesel by 2020. On June 12, 2010, USG and the GOJ agreed to start joint research on new production methods of biofuels to contribute to the reduction of greenhouse gas emission. The two nations will invest a total of yen 1 billion (approximately USD 11 million) over three years for the program which includes a study on effective methods to produce fuel from algae.

Statistics

Ethanol – Conventional & Advanced Fuels (KL)							
Calendar Year	2006	2007	2008	2009	2010	2011	2012
Production, Total	37,710	39,901	42,655	35,982	50,000 [1]	60,000 [1]	60,000 [1]
Advanced Only[3]	37,680	39,200	41,949	4,281	4,281	4,281	4,281
Imports	0	0	0	0	0	0	0
Exports	0	0	0	0	0	0	0
Consumption	37,710	39,901	42,655	35,982	349,800	420,000	420,000
Ending Stocks	0	0	0	0	0	0	0
Production Capacity – Conventional							
No. of Biorefineries	3	6	6	6	6	6	6
Capacity (KL)	701	31,701	31,701	31,701	31,701	31,701	31,701
Capacity Use (%)	4%	2%	2%	100%	100%	100%	100%
Production Capacity – Advanced							
No. of Biorefineries	3	4	8	9	9	9	9
Capacity (KL)	116,520	116,534	116,739	116,776	116,776	116,776	116,776
Capacity Use (%)	32%	34%	36%	4%	4%	4%	4%
Co-product Production – Conventional only (1,000 MT)							
N/A	–	–	–	–	–	–	–
N/A	–	–	–	–	–	–	–
Feedstock Use – Conventional (1,000 MT)							
Rice for non-food purpose	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Off-spec wheat	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Sugar beets	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Sugar cane	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Molasses	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Feedstock Use – Advanced (1,000 MT)							
Rice straw	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Wood & lumber wastes	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Soy pulp	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Imports of Bio-ETBE (KL), HS Code 2209-19-010							
Calendar Year	2006	2007	2008	2009	2010	2011	2012
Imports	0	7,500	6,694	56,923	699,533	840,000 [2]	840,000 [2]
Calculated volume of bioethanol		3,214	2,869	24,396	299,800	360,000	360,000

Sources: MAFF, Ministry of Finance,

1) The GOJ's short term goal

2) Forecast by PAJ

3) Because some data was given in weight, the volume was calculated with the specific gravity of 0.7955.

Ethanol Used as Other Industrial Chemicals (KL)							
Calendar Year	2006	2007	2008	2009	2010	2011	2012
Production	375,624	354,319	360,243	398,862	400,649	377,939	378,402
Imports	12,039	3,010	14,866	8,788	8,025	9,346	8,807
Exports	81	112	57	10,618	4,489	3,071	3,669
Consumption	358,230	361,574	372,078	403,697	390,420	377,200	380,994
Ending Stocks	53,682	46,500	42,385	35,555	49,119	45,448	43,801
Production Capacity							
Capacity (KL)	554,635	590,462	574,800	606,946	624,696	590,308	597,442
Capacity Use (%)	68%	60%	63%	66%	64%	64%	63%

Sources: METI, Ministry of Finance

Biodiesel – Conventional & Advanced Fuels (KL)							
Calendar Year	2006	2007	2008	2009	2010	2011	2012
Production, Total	4,471	6,229	6,494	8,568	20,000[1]	20,000 [1]	20,000[1]
Advanced Only	0	0	0	0	0	0	0
Imports (Metric Tons)[2]	16,929	12,808	12,576	10,197	13,222	–	–
Exports (Metric Tons)[3]	0	0	287,504	275,687	350,601	–	–
Consumption	4,471	6,229	6,494	8,568	20,000	20,000	20,000
Ending Stocks	0	0	0	0	0	0	0
Production Capacity – Conventional							
No. of Biorefineries[4]	0	4	13	22	26	–	–
Capacity (KL)[4]	–	2,920	9,897	11,616	12,021	–	–
Capacity Use (%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Production Capacity – Advanced							
No. of Biorefineries	0	0	0	0	0	0	0
Capacity (Mil. Liters)	–	–	–	–	–	–	–
Capacity Use (%)	–	–	–	–	–	–	–
Feedstock Use – Conventional (KL)							
Recycled cooking oil	4,870	6,785	7,074	9,333	21,786	21,786	21,786
Repeseed oil	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Sunflower oil	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Soybean oil	minimal	minimal	minimal	minimal	minimal	minimal	minimal
Feedstock Use – Advanced (1,000 MT)							
N/A	–	–	–	–	–	–	–
N/A	–	–	–	–	–	–	–
N/A	–	–	–	–	–	–	–
N/A	–	–	–	–	–	–	–

Sources: Japan Organics Recycling Association, Ministry of Finance

1) The GOJ's short term goal

2) HS Code: 382490-200; The unit is MT. As it includes products other than biodiesel, the unit is kept unconverted.

3) HS Code: 382490-900; The unit is MT. As it includes products other than biodiesel, the unit is kept unconverted.

4) This is the number of biorefineries receiving MAFF's financial assistance. According to the Japan Organics Recycling Association, about two hundred small-scale biorefineries are in operation in Japan.